

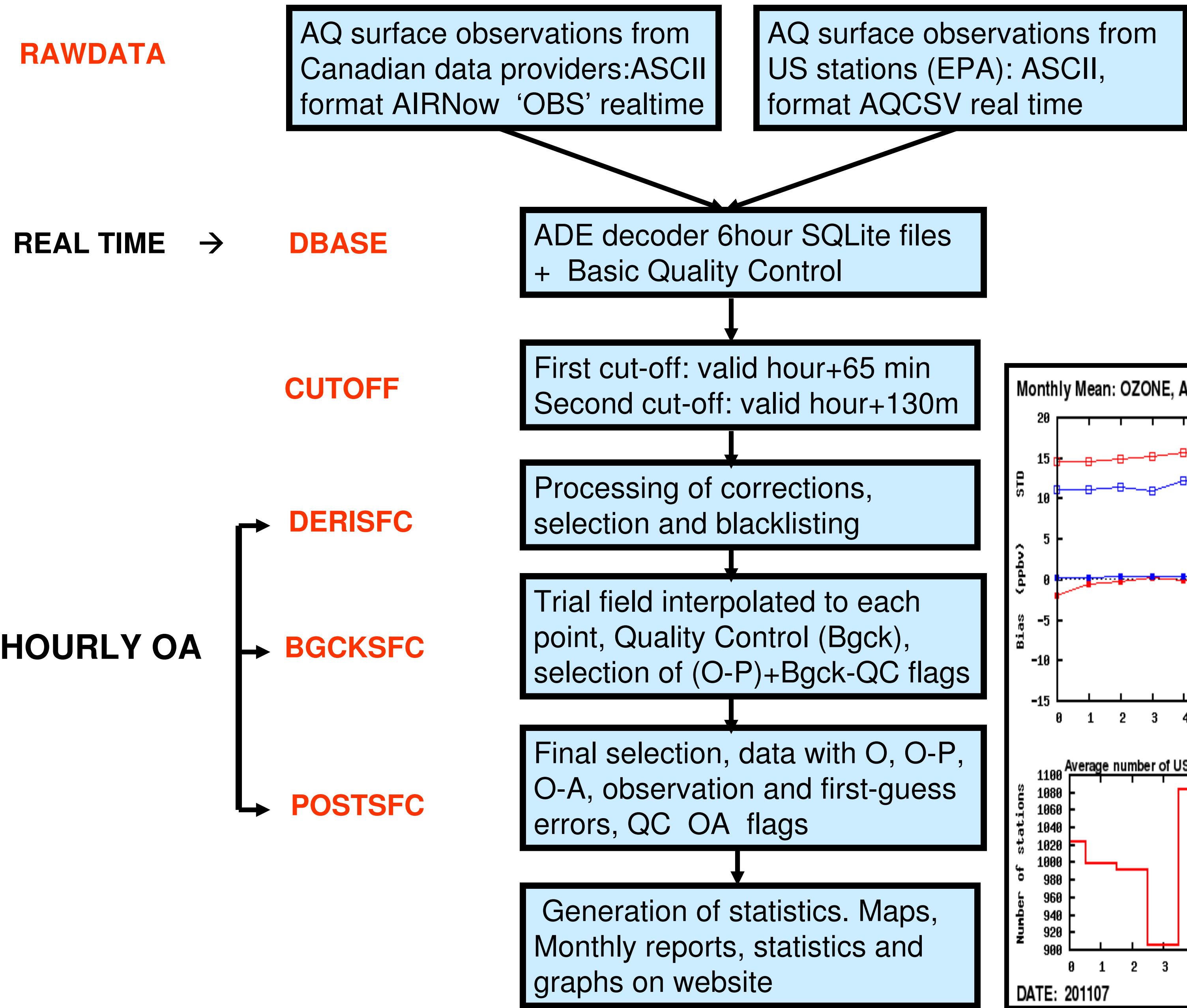
The Processing and Evaluation of Air Quality Data at the Canadian Meteorological Center

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INTRODUCTION

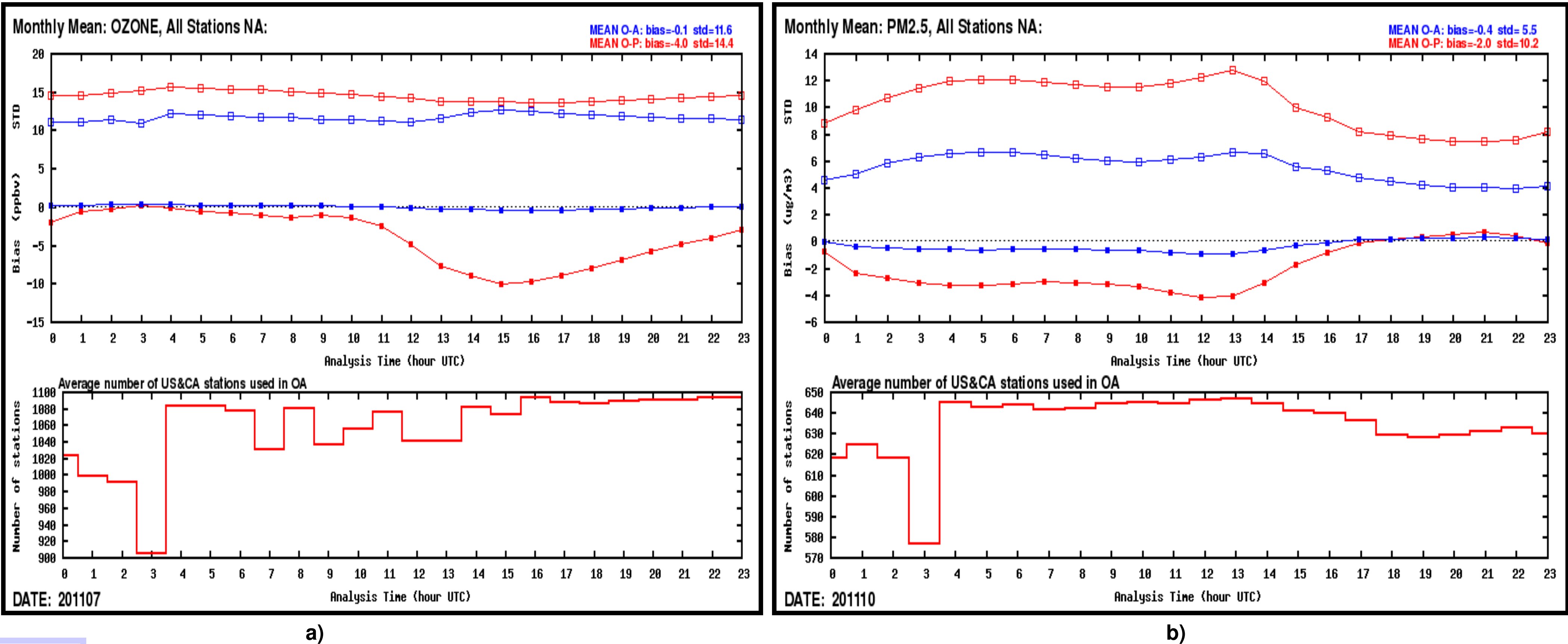
During the year 2011, a series of major modifications have been implemented in the SQLite database for air quality surface observations at the Canadian Meteorological Center (CMC). The Automatic Database Extraction system (ADE) was modified to decode observations for US stations from the new AIRNow Gateway (www.airnow.gov). Observations for Canadian stations continue to be decoded from Canadian providers. Thus, the objective analysis (OA) surface system which is a fundamental first step towards full-scale data assimilation, has access to a greater number of observations through new ADE SQLite files. The OA system currently runs in experimental mode to produce surface analyses for ozone and PM2.5.This poster focuses on the current situation of the air quality data processing which includes different stages of file evolution. The monitoring results and experimental products are available on an internal EC web site.

FLOWCHART OF AIR QUALITY SURFACE OBSERVATION PROCESSING



MONITORING OF SURFACE OZONE AND PM2.5 OBSERVATIONS

OA of surface ozone and PM2.5 is produced every hour using Global Environmental Multiscale (GEM-MACH15 version 1.4.4) model as background, Canadian (CA) and US data for observations, and an improved version of the optimal interpolation approach. The model and observation error statistics for surface ozone and PM2.5, specific to each station, are pre-computed for every hour and for four seasons. Monitoring procedures include the examination of the statistics for the observation minus first-guess values (O-P) and the observation minus analysis values (O-A) statistics for surface ozone and PM2.5 on a day-to-day basis or in terms of monthly means. The time series of these statistics are presented on a web site to evaluate the quality of ozone & PM2.5 data over different regions of North America separately and altogether for CA and US stations.



The air quality data processing includes different stages of file evolution: rawdata->dbase->cut-off->derisfc->bgcksfc->postsfc.

DBASE 6hour SQLite file contains two tables (header and data) with real-time reports of air quality surface data for 9 species (O3,NO,NO2,PM2.5,PM10,SO2,H2S,TRS,CO). The data processing system also includes two cut-off files for the valid hour of the analysis.

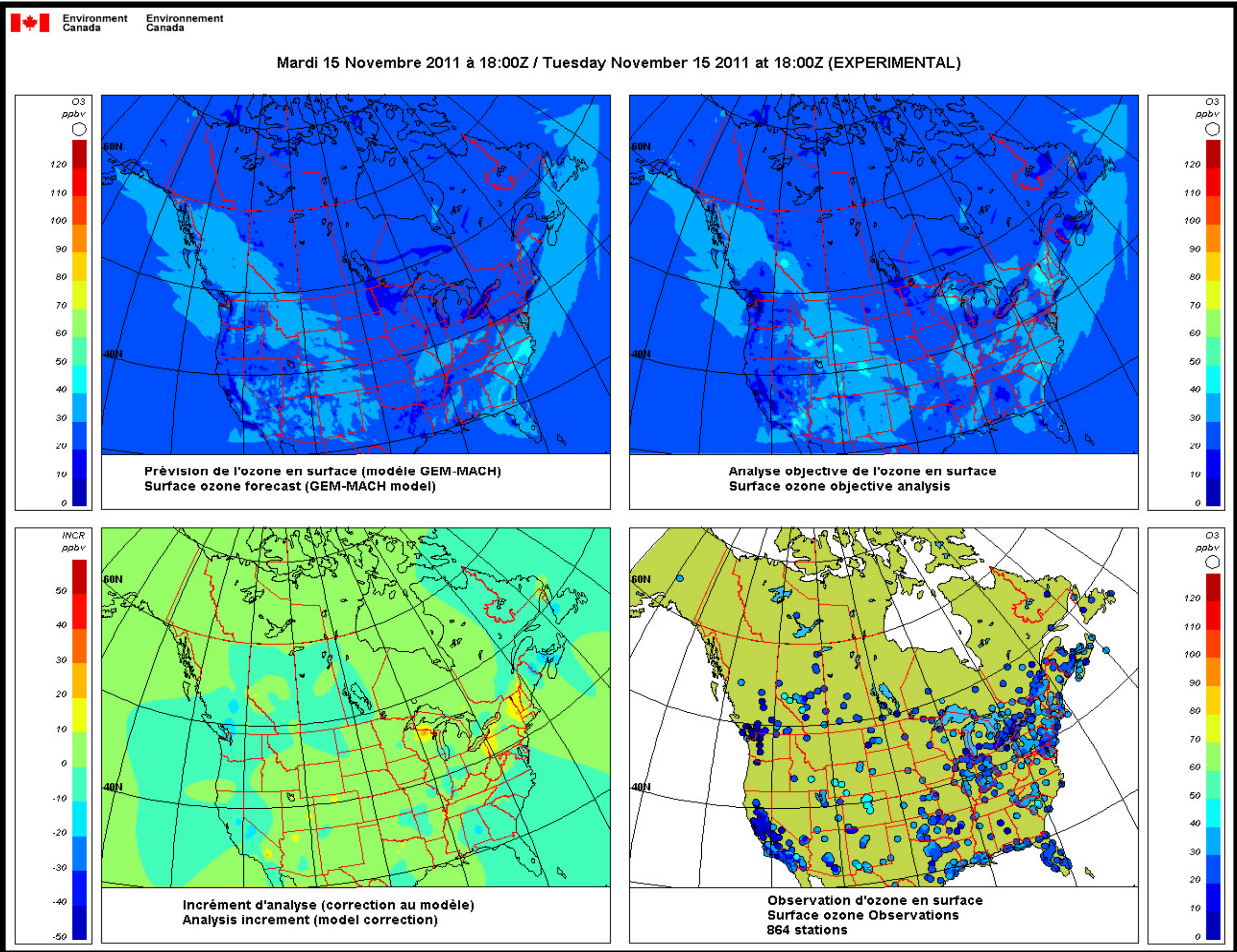
Each hour, two OA are applied to DERISFC files, first “early analysis” is generated at 65 minutes past the valid hour for approximately 80% of the total data and second “late analysis” for the same valid hour generated at 130min past the valid hour for approximately 94% of the total data. Both the early and late analysis are available on the internal EC web page. The DERISFC, BGCKSFC and POSTSFC SQLite files are produced hourly. The final POSTSFC file includes the air quality surface observation, O-P &O-A values, observation & forecast errors, correlation length and appropriate quality control flags for each reporting station.

Here is an example of a POSTSFC hourly file (combination of header and data tables) which includes the ozone data reporting by a few CA stations used in OA.

Example of CA stations:

id	stn	lat	lon	date	time	O3	flag	O-P	O-A	obs	err	fg	err
101301	49.096111	-122.5663	20110517	210000	44.4	4096	7.008	-2.713	16.9	48.5			
55501	45.05166	-72.86166	20110517	210000	22.0	4096	-11.0	-2.725	11.2	30.0			
80402	53.20169	-105.7520	20110517	210000	45.0	4096	9.717	-4.004	2.61	23.49			
40203	45.30888	-66.00833	20110517	210000	25.0	4096	5.472	3.9004	57.5	90.6			
40206	45.26972	-66.06138	20110517	210000	21.0	4096	1.538	0.0073	34.3	88.7			
40207	45.25277	-66.08003	20110517	210000	20.0	4096	0.551	-0.968	9.8	75.7			

Monthly mean O-P&O-A statistics over NA which include the bias, standard deviation and average number stations per UTC hour: a) for ozone observations, July 2011 and b) for PM2.5 observations, October 2011



An example of Surface Ozone 4 Panel Charts which include the model output, observations, analysis increment and OA for 15 November 2011 at 18Z. This is a typical case of “late analysis” generated at 130 minutes past the valid hour. There are 864 stations reporting ozone observations which account for approximately 92% of the total data (943 is the total number of all reporting stations and 852 is the number of US&CA stations used in OA).

FUTURE

The high value of the OA products has become well known over the past several years and regional forecasters have expressed a strong interest in having full support for these products. This experimental version of OA is currently running in development mode “off-line” meaning that the resulting analyses do not serve as input for the model in the subsequent integration. An operational version is planned to be implemented in the spring 2012. CMC Op-run task sequencer (MAESTRO) will be used to create a modular suite as part of the current operational suite. Each module would represent a particular process in the OA for supporting and developing the air quality database and the forecast files containing trial fields, analyses and increments. The future of this project is an initialization of GEM-MACH15 model as well impacting UMOS (Updateable Model Output Statistics) forecasts.

REFERENCES

Robichaud A., et R. Ménard. Development and implementation of an operational surface ozone objective analysis at CMC. Internal Report, Nov. 2003, CMC, EC.

BURP User’s guide (EC internal document: <https://wiki/cmc.ec.gc.ca/wiki/BURP>)

Objective Analysis of Ozone and PM2.5 (experimental web site, available from internal AQMAS/AQHI: <http://aqhi.cmc.ec.gc.ca>)

ACKNOWLEDGMENTS: R.Ménard Air Quality Research Division EC, P-A Beaulieu Air Quality Modelling Applications Section EC.

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